A cocoonspinning Thrips

by

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With plate 1.

In studying the cacaothrips (*Heliothrips rubrocinctus* GIARD) in Surinam, two carnivorous thrips-larvae were found, preying on the larvae of the former. They are often seen among the colonies of cacaothrips-larvae and easily discovered by their habit of running very rapidly, much faster than those of the cacaothrips. One has a broad red band on the six first abdominal segments (fig. 1), the other has a uniform reddish colour.

From an article in bulletin XVII of the Dept. of Agriculture of Trinidad and Tobago by C. B. WILLIAMS, entitled: Notes on some Trinidad thrips of economic importance, it is evident, that these are the larvae of *Franklinothrips tenuicornis* HOOD and *F. vespiformis* CRAWFORD. The adults, bred from these larvae, also agree with the description given there (p. 143—144); an adult, bred from the former larva, was determined by Mr. A. C. MORGAN (of the Bureau of Entomology in Washington) as *F. tenuicornis* HOOD.

F. tenuicornis is common in Surinam wherever the cacaothrips is found, but, according to the cited article, it was only known from Trinidad and Panama [1]). *F. vespiformis*, which is common in the West-Indies and in Central-America, is much rarer here.

Several times the larvae of *F. tenuicornis* were seen sucking

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[1]) According to the „Review of applied Entomology" vol. III, Series A (1915) it was described by J. D. HOOD in: „Ent. News" (Philadelphia) XXVI, p. 162—166 (April 1915) as *F. tenuicornis* n. sp.

out cacaothrips-larvae, both in the field and laboratory. Sometimes they took other small larvae (of Homoptera) and once it was observed, that an adult cacaothrips was attacked. Their importance as natural enemies of the cacaothrips however is small, for they take no more than one larva per day and their number compared with that of the cacaothrips is very small, perhaps no more than 0.1 %.

The most peculiar habit, which to my knowledge has never been described in the case of Thysanoptera, is the spinning of a cocoon before pupation. This cocoon was always made in the angle, formed by the midrib and lateral veins of the leaf (fig. 4). Once it was spun in a curled-up tip of a piece of blottingpaper, laid in the Petri-dish, in which the thrips was bred, to keep the air moist. Of ten cases, in which pupation was observed, once it happened without making a cocoon and once a larva, that begun spinning (fig. 4), broke its threads, when the light was too much concentrated on it while under the microscope, and pupated free on the blottingpaper.

The spinning was begun by attaching some threads between the veins (fig. 4). The larva, enclosed under this web, in about 24 hours makes a dense cocoon of it, which is also closed at the bottomside, as is seen when it is detached from the leaf. After it is ready, the insect pupates. No prepupa-stage (a stage with wingcases and free antennae) was found as in other thrips. A cocoon with a pupa in it, mounted in Canada-balsam, showed only one cast skin. This was the skin of the larva, as was evident by the structure of the antennae. It showed, that mandible and maxillae were also cast in this molting. P. BUFFA („Redia" VII, p. 71—107) has found for *Heliothrips haemorrhoidalis* BOUCHÉ, that the mouthspines are only once shed, namely at the end of the larval period in changing to prepupa. This fully explains, that during the prepupa- und pupa-stage no food is taken and the insects remain motionless when not disturbed. Many of my observations confirmed this fact. The same was found in *Heliothrips rubrocinctus*, where during the whole larval period strongly chitinized mouthspines with brown tips are seen, even in embryos prepared out of the leaf. In molting

to prepupa they are cast and it is very difficult to trace the new ones in the pupa and prepupa. When the pupa molts, their appearance is again very distinct and the insect again starts feeding. In the pupae of *F. tenuicornis* also no distinct mouthspines are seen, whilst those in the larvae and the cast larval skins are very conspicuous by their strong chitinization.

Besides the presence of only one cast skin within the cocoon of the pupa, which apparently is the larval skin, the following observation also proves, that probably no prepupa-stage exists. One larva, that started spinning at 11^{00} a. m., was still larva the next day at 7^{00} a. m., but another, that began at 8^{15} a. m., was a pupa on the next day at 7^{30} a. m., the difference only being 3 hours 15 minutes. That the prepupa-stage is sometimes omitted, was proved by another observation on the cacaothrips A larva was put on a hollow objectslide, closed by a coverglass, for the purpose of drawing it; meanwhile it molted and a complete pupa emerged.

During spinning the head and fore-legs are very active, but not the abdomen; this is clearly visible when the larva is seen suspended from the upper wall of the cocoon. The fore-legs easily ply in the tibio-femur articulation. I could not find any trace of glands in these legs, so that the spun threads are probably produced by the mouth, but as the head is moved very quickly, this could not be seen under the microscope. The long slender antennae are bent backward and pressed against the wall of the web; they may possibly render some service in giving the cocoon its right shape and dimensions. The cocoon itself consists of anastomosing threads of variable thickness, somewhat thickened at the knots (fig. 5).

Generally the pupa seems to spin no more, but the following observation indicates, that it may be able to do so. A hole was found in the cocoon of a pupa that had been spun one day before and was uninjured in three former observations; 15 hours later it was again closed.

Once it was seen, that a larva, just begun with spinning, broke its silk, which seemed to require a great effort, though there were only very few threads (fig. 4). How this is done

at the emergence of the adult, either mechanically or by the secretion of a fluid, was not traced. Perhaps the peculiar hook-like appendage, found only on the fore-legs of the family Aeolothripidae, and which is also present in *F. tenuicornis* (fig. 6), may help in breaking the cocoon.

As the cocoon is rather opaque, it is somewhat difficult to observe the development of the larva. In one case the cocoon was very thin, so that the transformations could be easily traced; they were still better seen when the larva pupated free, as twice happened, but then the development seems to be an abnormal one. In eight observations the following progress of development was found.

About 24 hours after the spinning had begun, a pupa was present. On the 2nd day the tip of wingcases reached the 2nd segment of the red abdominal band: the pigmentation was still the same. On the 3rd day the length of the wingcases was the same. The white segments of the abdomen behind the red band had turned slight reddish. Head and thorax were orange, the eyes had become darker. On the 4th day: Wingcases extending to the end of the red band, antennae to the last (6th) segment of it. On the 5th day the whole abdomen, except its tip, was red, while on the 6th day the first 3 abdominal segments had acquired a white colour as in the adult (fig. 3). The wingcases had distinct setae, those at the tip of abdomen were also present. Antennae still recurved. On the 7th day the antennae were detached from the body, so that the adult probably had emerged [1]). Wingcases the same. On the 8th day the whole body, with exception of the first 3 abdominal segments, base of antennae and last segment of abdomen, had a dark colour; the wings showed distinct veins and dark crossbands. On the 9th day the adult left its cocoon (in one case on the 10th day).

In the two experiments where no cocoon was spun, the development seemed to be abnormal and defective:

1) On the first day the larva that had begun to spin (fig. 4) left its silk when it was disturbed, second day:

[1]) Another, released from its cocoon at the 7th day, had all the characteristics of the adult, but the pigmentation was still very imperfect.

Pupa (15 hours before it was still larva) with wingcases already at the end of the red band, antennae at the end of the first abdominal segment (fig. 2). Colour of abdomen behind the band reddish, thorax orange. Third day: Hind-margin of the red band scarcely more visible. Wingcases and antennae the same. Fifth day: Adult, but deformed.

II) First day: Larva dull. Second day: Pupa. Wing-cases reaching 2nd abdominal segment. Third day: Abdominal band much paler, the other abdominal segments reddish. Wingcases reaching last segment of the band, antennae almost equally far. Fourth day: The same, but colour darker, especially of last four segments. These were still darker on the fifth day. Sixth day: Pupa died.

In the breeding-experiments the larvae often died. They were found entangled in a very sticky, almost solid, drop, apparently vomited by the insect itself. This phenomenon was never observed in *Heliothrips rubrocinctus* GIARD or *H. haemorrhoidalis* BOUCHÉ, though they were bred as long as a year. Whether this is due to a particular disease, or has some relation to the fluid used for spinning, was not determined.

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P. S. Afterwards I see from a review of a russian publication, that N. V. KURDJUMOV in 1913 observed the spinning of a cocoon in *Aeolothrips fasciatus*. Probably other Aeolothripidae will do the same. The following note is given (Review of applied Entomology IV A (1916) p. 166): "The larvae of *A. fasciatus* were observed to weave a cocoon, which had not previously been recorded in the case of thrips, inside which they pass the stages of prónymph and nymph. The duration of the pronymphal and nymphal stages are equal, a fact which distinguishes these insects from other Thysanoptera".

EXPLANATION OF PLATE 1.

All figures were drawn with a camera lucida (except fig. 4), 1—2 after specimens freshly killed in alcohol, 3—6 after

preparations in Canada-balsam; they relate to *Franklinothrips tenuicornis* HOOD.

1 = full-grown larva.
2 = pupa of larva that pupated free. Had begun spinning the day before at 9°° a. m., but left this when disturbed, was still larva at 5°° p. m. and was not spinning. Next day at 8³° a. m. it had reached the stage figured here.
3 = adult. Abdomen slightly extended by the pressure of the coverglass.
4 = base of cacaoleaf with one cocoon ready and beginning of another.
5 = tissue of cocoon.
6 = tarsus on fore-leg of adult with hooklike appendage.